

**Mineral Trioxide Aggregate Apexification: A Case Report**

Dr Nimra Iqbal, MDS conservative dentistry and endodontics, ITS dental college and hospital Greater Noida

Dr Sana Farooq, MDS Pedodontics department, ITS dental college and hospital Greater Noida

**Corresponding Author:** Dr Nimra Iqbal, MDS conservative dentistry and endodontics, ITS dental college and hospital Greater Noida

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**Abstract**

For achieving success a good apical seal is very crucial following root canal treatment in roots with open apex. To prevent movement of bacteria and their by-products from the root canal system into the periapical tissues and vice versa, root end filling material is used to provide an apical seal. To achieve a good apical seal various procedures have been tried. The most commonly used is Gutta-Percha for obturating the canal without creating an apical barrier, Inverted cones, periapical surgery, apexification. The various materials which were used as an apical barrier were calcium hydroxide, super EBA, amalgam etc but recently MTA is gaining popularity. However, in the wide apical area MTA will be difficult to be placed there and requires the use of an apical matrix. Materials such as collagen, hydroxyapatite and calcium sulfate have been used for this purpose. This article describes the use of MTA as an apical seal in wide apex canals following obturation.

**Keywords:** Apexification, Mineral Trioxide Aggregate, Collagen

**Introduction**

Apexification is a method to induce a calcified barrier in an open apex of root or the continued apical development of an incomplete root in teeth with necrotic pulp.<sup>1</sup> These

immature teeth usually have thin, fragile walls that makes it difficult to sufficiently clean and to attain the required apical seal. After disinfection of the root canals in the traditional manner calcium hydroxide was used to induce apexification. However, this material requires 5–20 months to form the hard tissue barrier.<sup>2</sup> The resistance of the dentin to fracture is decreased by using calcium hydroxide as an apical barrier material.<sup>3</sup> So an alternative to calcium hydroxide apexification is a one-step apexification technique using mineral trioxide aggregate (MTA) as an artificial barrier. The advantage of MTA apexification are: (i) possibility to restore the tooth with a minimal delay (ii) Reduction in treatment time (iii) stimulation of repair (iv) no changes in the mechanical properties of dentine and (v) excellent biocompatibility.<sup>4</sup> The major disadvantage of MTA has a disadvantage in its manipulation due to which its placement in the wide apical area is difficult to achieve. A matrix can be used in apexification procedures against which MTA can be placed and condensed. Calcium sulfate, hydroxyapatite, resorbable collagen, and platelet-rich fibrin are several materials which are used to create a matrix.<sup>5-7</sup> In this case series, we are presenting two cases of MTA apexification using cola cote as an resorbable collagen material as the apical matrix.

## Case Report

A 20yrs old male patient reported with a chief complaint of discolored right maxillary central incisor. History revealed that the patient had suffered trauma 4 years back. Clinical examination revealed grayish black discoloration of tooth 11. There was no sign of abnormal mobility or sensitivity to percussion in the tooth. Also there was no response seen in both cold and electric sensibility tests. Periapical radiolucency and wide open apex was seen in relation to tooth 11 on periapical radiograph [Figure 1b]. Pulpal necrosis with chronic apical periodontitis in relation to tooth 11 was the final diagnosis. MTA apexification with the use of an apical matrix was opted after discussing various treatment options to the patients guardians. Written consent was obtained from the guardian of the patient. Access opening was done in relation to 11 and working length was established radiographically [Figure 1c]. Biomechanical preparation of Root canal was done with circumferential filing using the International Organization for Standardization (ISO) 80 K-file (Dentsply Maillefer) in conjunction with copious amount of 0.5% sodium hypochlorite. 17% ethylenediaminetetraacetic acid (EDTA) solution was used for smear layer removal. Apex Cal medicament paste (Ivoclar) was placed in the root canal, and access cavity was restored with cavif. One week later, tooth was again accessed, and copious amount of normal saline was used to remove any remnants of the calcium hydroxide medicament. Canal was thoroughly dried with absorbent paper points. Cola cote collagen matrix was used for the formation of apical matrix. The matrix was gently placed on working length with the help of preselected hand pluggers, and its position was verified using radiographs. White MTA Angelus (Angelus, Londrina, PR, Brazil) was mixed according to manufacturer's instructions and using hand pluggers, gently condensed against the matrix to

form 4 mm of apical plug [Figure 1d]. After placing a moist cotton pellet, the access cavity was restored with cavif. Next day, root canal was obturated using lateral condensation of Gutta-percha and AH-Plus root canal sealer (Dentsply Detrey GMBH, Germany) [Figure 1f], and tooth was restored with composite resin restoration (Coltene/Whaledent). Porcelian fused to metal crown preparation was done in the respective tooth and prosthesis was made [Figure 1g,h] The patient was recalled after 3 months for clinical and radiographic evaluation. At the follow-up visit, clinical examination revealed normal mobility, probing depths, and normal function without symptoms. Radiograph demonstrated the healing periapical lesion.



Figure 1: (a) pre operative clinical picture (b) pre operative radiographic picture (c) working length determination (d) Mineral trioxide aggregate plug (e) Master cone radiograph (f) obturation radiograph (g) post operative radiographic picture with PFM crown (h) post operative clinical picture with PFM crown.

## Discussion

Apexification is a method that induces a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp. This barrier is mandatory to allow the compaction of the root filling material. Calcium hydroxide has been considered as an efficient material that was considered for this purpose was calcium hydroxide.<sup>8</sup> But this material has several disadvantages such as difficulty of the patient's recall management and delay in the treatment.<sup>9</sup> After dressing with calcium hydroxide for extended periods risk of tooth fracture was common.<sup>3</sup> MTA is the most promising alternative to calcium hydroxide.<sup>10</sup> The advantages of this material are (i) no adverse effect on the mechanical properties of root dentin (ii) immediate restoration of the tooth, (iii) reduction in treatment time. In a prospective study, apexification treatment with MTA showed a high prevalence of healing and apical closure. There is a risk of extruding MTA into the periapical area in a wide open area.<sup>11</sup> Various materials have been advocated to be used as a matrix, for example, hydroxyapatite, calcium sulfate, platelet-rich fibrin, collagen.<sup>12</sup> In this study collagen resorbable material was used as an apex matrix. The matrix was pushed into the periapical area with the use of plugger. After the matrix was placed at the desired position, then MTA was condensed against it. The apical matrix mentioned here in our study is easily available, cost-effective, and provides for adjustment of its position. This collagen matrix gets resorbed by its own.

## Conclusion

Managing a tooth with open apex with a biocompatible material MTA has become a single visit procedure. This innovative procedure is predictable and less time-consuming one. The management of a structurally weakened root through conservative approach by

reinforcement with post can be a simple and efficient procedure for the treatment of immature anterior traumatized teeth with good functional results.

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